although at great distances from each other, namely, near Malines, Antwerp, Liege, Louvain, Charleroi, and Courtrai. Those of Aerschot, Nazareth, Wesemael, fine old buildings, were totally destroyed; those of Puers, Lierre, Aerselaer, Lobbes, Walcourt, Marchienne au Pont, Liege, Courtrai, Moorslede, suffered more or less in the steeples or towers.

March 8, 1860.

Sir BENJAMIN C. BRODIE, Bart., President, in the Chair.

The following communications were read:—

I. "On the Solar-diurnal Variation of the Magnetic Declination at Pekin." By Major-General EDWARD SABINE, R.A., Treas. and V.P.R.S. Received February 2, 1860.

When the first year of hourly observations of the declination, January 1 to December 31st, 1841, was received at Woolwich from the Magnetic Observatory at Hobarton, and when means had been taken of the readings of the collimator-scale at the several hours in each month, and these monthly means had been collected into annual means, it was found that the mean daily motion of the declination magnet at Hobarton presented, as one of its most conspicuous and well-marked features, a double progression in the twenty-four hours, moving twice from west to east, and twice from east to west; the phases of this diurnal variation were, that the north end of the magnet moved progressively from west to east in the hours of the forenoon, and from east to west in the hours of the afternoon; and again from west to east during the early hours of the night, returning from east to west during the later hours of the night: the two easterly extremes were attained at nearly homonymous hours of the day and night, as were also the two westerly extremes; the amplitudes of the arcs traversed during the hours of the day were considerably greater than those traversed during the hours of the night.

When, in like manner, the first year of hourly observations, July 1st, 1842, to June 30th, 1843, was received from the Toronto Observatory, and the mean diurnal march of the declination magnet

was examined, it was found to exhibit phenomena in striking correspondence with those at Hobarton. At Toronto also a double progression presented itself, of which the easterly extremes were attained at nearly homonymous hours, as were also the westerly; whilst the hours of extreme elongation were nearly the same (solar) hours at the two stations, but with this distinction, that the hours at which the north end of the magnet reached its extreme *easterly* elongation at Hobarton were the same, or nearly the same, as those at which it reached its extreme *westerly* elongation at Toronto, and *vice versâ*. Pursuing, therefore, the ordinary mode of designating the direction of the declination by the north end of the magnet in the southern as well as in the northern hemisphere, the diurnal motion of the magnet may be said to be in opposite directions at Hobarton and Toronto; but if (in correspondence with our mode of speaking in regard to another magnetic element, the Inclination) the *south* end of the magnet is employed to designate the direction of the motion in the *southern* hemisphere, and the *north* end in the *northern* hemisphere, the apparent contrariety disappears, and the directions, as well as the times of the turning hours, are approximately the same at both stations.

The double progression in the diurnal variation, which was thus so distinctly and concurrently marked at stations so distant from each other, and at which the observations had been conducted with an elaborate care which would admit of no doubt as to the dependence to be placed on their general results, was at that time in great measure an unexpected and even a startling phenomenon. In the well-known description given by M. Arago (in the instructions drawn up for the voyage of the 'Bonite' in 1836) of the general phenomena of the diurnal variation in different parts of the globe, as then known, they are represented as consisting of a single progression only, with but one easterly and one westerly extreme, both occurring during the hours of the day; and no reference or allusion whatsoever is made to the existence of a double progression, or of a nocturnal interruption to the continuous motion in the one direction between the two extremes*. That the diurnal motion must be a

* From the omission on the part of M. Arago of any notice of a nocturnal feature, it might perhaps be inferred that the diurnal variation at *Paris* is actually, as described by him, a single progression: it seems very improbable, however,

consequence, in some way or other, of the sun's action, could not be doubted, from the fact that the period in which the variation takes place is a solar day; and whilst the progression was regarded as a single one in the twenty-four hours, it accorded sufficiently well with the prevailing notion, that the magnetic variations were produced by variations of temperature, to meet the general view, notwithstanding the grave doubts and dissents which from time to time had been expressed by those who more closely examined the phenomena of particular localities. As the existence of a well-marked double progression at some stations on the globe could, however, no longer be disputed, the difficulty which now presented itself was to explain in what way this apparently double action of the sun was produced.

On a careful examination of the diurnal motion of the declination magnet on *different days* of the years referred to at the commencement of this paper, it soon became obvious that, both at Hobarton and Toronto, many days occurred in which the diurnal march was a single progression, the nocturnal retrogression wholly disappearing; and that there were many more days in which this was more or less approximately the case. It further appeared, on subsequently comparing the observations of the *same* years at both stations, that the days most distinguished by a large and even sometimes an extravagant interruption of the otherwise continuous *single* progression, were generally the *same days at both stations*; and by extending the comparison to other though less complete series of observations in other parts of the globe, these days were identified as those *on which magnetic storms had prevailed*; viz. days which had been distinguished by the occurrence of perturbations, often of very considerable magnitude, affecting simultaneously the magnetic elements in all parts of the globe as far as observation extended, presenting a remarkable uniformity in the effects produced at *contiguous* stations, but (as shown by the simultaneous observations at Toronto and Hobarton) manifesting a great variety both in the character and the amount of disturbance in parts of the globe distant from each other. To separate the observations affected by these exceptional and casual influences from the ordinary and what might be deemed

that this should be the case, since the observations at Greenwich and Kew have shown that the progression is double at those stations.

the normal position of the declination magnet, and to study the laws of each taken *separately*, as well as in their combination, became therefore a preliminary work to the right understanding of either. That some such mode of examination would be required, had indeed been anticipated in the instructions drawn up with so much sagacity by the Committee of Physics of the Royal Society, for the guidance of those who should engage in the direction of the Colonial Magnetic Observatories then in contemplation. In the preface to those instructions, it is expressly stated that "the progressive and periodical magnetic variations are so mixed up with the *transitory* changes, that it will be impossible to separate them so as to obtain a correct knowledge and analysis of the *progressive* and *periodical*, without taking express account of and eliminating the transitory or casual." The difficulties which impeded, and which still impede *an entire* compliance with this instruction, viz. the *perfect* elimination of the transitory and casual changes, were found to be very great. The direction which the magnet assumes when it is under the influence of a perturbation of this nature, is not distinguishable from the direction assumed under the ordinary magnetic influence, by any other criterion yet known than by the magnitude of its deflection from the mean or normal position in the same month and at the same hour; the magnitude of the abnormal deflection may be thus taken, to a certain extent, as a means of recognizing the existence of a perturbing force, and it is the only one we possess. If we employ this criterion of magnitude as manifesting a disturbed observation, and separate the observations so disturbed from the others, we must still be aware that there may exist, and that probably there do exist, amongst the body of observations from which the large disturbances have been separated, some which may be affected by the same disturbing cause or causes operating in a minor degree; and assuming the disturbances to have different laws from the general body, the unseparated minor disturbances may still impede the perfect deduction of the laws of the other class with which they are so intermixed.

But though the criterion of magnitude may not enable us to effect a *complete* separation of the two classes, it will suffice to accomplish an approximation to that end; it will separate a sufficient body of disturbed observations,—disturbed beyond the limit of any other

known influential cause,—to permit the laws of the disturbing action to be investigated; and when these laws are known, we are furnished with the means of making at least an approximate estimation of the influence exercised by the uneliminated minor disturbances on the laws which we may proceed to deduce for the class of observations from which we have not been able to effect their perfect separation.

Adopting this method of partially eliminating the influence of the magnetic storms in the observations at Hobarton and Toronto, and proceeding in the first instance with the caution suitable to a first experiment, an unnecessarily high value (as it subsequently proved) was taken as that which should distinguish a perturbed observation, and consequently but a small body of disturbed observations was separated. On a recalculation of the diurnal variation after the elimination of these, and a comparison of the results with the diurnal variation obtained previously from the whole of the observations, the character of the influence of the magnetic storms was very manifest. By the elimination of the larger disturbances, the interruption to a continuous progression from the afternoon of the one day to the morning of the following, was considerably diminished both in continuance and amount. A smaller separating value was then taken, and consequently a larger body of disturbed observations was eliminated; the effect produced was a still further reduction of the nocturnal feature. These first essays were sufficient to show that the mean effects of the magnetic storms on the declination magnet, both at Hobarton and at Toronto, attained a maximum in the early hours of the night, and constituted at both stations a very considerable part, if not the whole, of the nocturnal portion of the double progression which has been described. By still further diminishing the separating value, but still keeping it well within the limits in which no complication of disturbing causes would be hazarded, so little was found to remain of the nocturnal interruption, that I ventured, in the 1st volume of the 'Toronto Observations,' published in 1845, to express the opinion that "*if the whole influence of the magnetic storms could be eliminated from the observations, the residual portion of the diurnal variation would be a single progression with but one maximum and one minimum in the twenty-four hours.*"

The peculiar character of the magnetic storms (or disturbances as they are sometimes called), and the periodical laws exhibited in their mean effects, have been the subject of frequent investigations since 1845. It is not necessary to notice on this occasion the results of these further than as they are connected with the explanation of the phenomena of the diurnal variation, which forms the subject of this paper. It has been shown, by abundant evidence, that though apparently casual in the times of their occurrence, the magnetic storms nevertheless produce mean effects, which, when the observations of more than a very few days are combined, are seen to be of a highly systematic character in all parts of the globe where their effects have been examined :—that the mean deflections which they occasion have always their particular hours of extreme elongation, with continuous intermediate progression :—that these hours are different in different parts of the globe, exhibiting apparently every possible variety :—that the *disturbance diurnal variation*, as for distinction's sake it may be called, constitutes everywhere a sensible portion of the diurnal variation shown by the mean of the hourly observations from which no elimination of disturbed observations has been made :—that the diurnal variation so obtained is in fact a resultant of two diurnal variations superposed, both referable to the sun as their primary cause, but manifesting by the difference in the character of the effects produced, a distinction in the mode of operation to which they are severally due. The disturbance variation is caused by deflections which are only of occasional occurrence; the more regular solar diurnal variation is distinguished, on the other hand, by the regularity of its daily occurrence; and its hours of extreme elongation, or (as they may be more familiarly termed) its turning hours are the same, or nearly the same hours of local solar time in all parts of the globe, whilst those of the disturbance variation show almost every possible variety. The relative magnitudes or proportions of the two components differ also very greatly at different stations; and thus, by the operation of causes which as yet are but very imperfectly known, at localities where the magnetic storms are excessive, the disproportion of the components becomes excessive also, and the phases of the regular variation are rendered altogether subordinate to those of the disturbance variation. Until therefore the extension of observations shall give rise to and establish some

general theory whereby the influence of the disturbances in different parts of the globe may be predicated, their particular laws at every station must be sought by a special investigation; and no conclusion in regard to either of the components of the diurnal variation is entitled to be viewed as final which has not been preceded by such an investigation.

It has appeared desirable to enter more at length into this preliminary statement than may at first sight be thought to be required by those who have followed the different stages of the inquiries referred to, because the interpretation, which was given so far back as 1845, of the diurnal variation at Toronto and Hobarton, has scarcely received the consideration which might seem due to a laborious and apparently successful analysis of the phenomena; and there are some eminent physicists who have framed or adopted theories for the explanation of the diurnal variation, in which theories the existence of a double progression as a universal and necessary phase is essentially implied. Amongst these, the most prominent perhaps, and the one which has obtained the widest circulation, is the theory of the R. P. A. Secchi, Director of the Observatory of the Collegio Romano, published originally in Italian in 1854 in the 'Correspondenza Scientifica' in Rome, translated into English in the edition of 1857 of the late Dr. Nichol's 'Cyclopædia of the Physical Sciences,' and more recently adopted in the third volume of M. de la Rive's 'Traité d'Electricité.' In M. Secchi's memoir, the diurnal variation, with its double movement in the day and night, is ascribed to the direct action of the sun as a distant and powerful magnet, influencing the magnetic needle at different stations on the globe in a manner contingent upon the direction of the magnetic meridian at each place, and producing extreme deflections to the East and to the West twice in the twenty-four hours, the turning hours being about six hours apart, and stated to be appropriately represented by a formula of two terms, one involving the sine of the hour-angle, and the other the sine of twice that angle: the phenomena of the double progression at Toronto and Hobarton are thus viewed by him as "Types of all that happens beyond the limits of the torrid zone."

If I have represented M. Secchi's views correctly, and I think I have done so, the question between the conformity to nature of his views and mine would be tested by the facts (when they should be

known) of the diurnal variation at a station in the middle latitudes where the principal influence of the magnetic storms should take place, not in the hours of the *night*, but in those of the *day*. According to my interpretation of the phenomena at Toronto and Hobarton, such a station ought to exhibit a single progression; according to M. Secchi's, a double progression with turning hours about six hours apart. Such a station would therefore furnish what might be deemed a *crucial* experiment. In the extension of our experimental knowledge which might be expected to follow from the adoption by Her Majesty's Government of the recommendations of the Royal Society and of the British Association, which have been communicated to Lord Palmerston with so much earnestness of purpose, and with so just an appreciation of their importance, by His Royal Highness the Prince Consort, as President of the British Association, it had been anticipated that it would not be long before the evidence derivable from such a station would be secured to us. I have found it, however, sooner than I had expected, or had hoped for, in the three years and ten months of hourly observations of the Declination at Pekin, from January 1, 1852, to October 31, 1855, made under the superintendence of M. Scatchkoff, attached to the Russian Embassy at Pekin, and published by our distinguished foreign member, M. Kupffer, in the volumes of the 'Annales de l'Observatoire Physique Central de Russie.' The results of these observations, as far as they bear on the questions of the general phenomena of the diurnal variation, and on the mode in which these may be explained, form the subject of the present communication.

The examination of these observations was first undertaken by me for the purpose of ascertaining, as far as possible by their means, the precise epoch of minimum in the so-called decennial period of the magnetic storms. With this view a separation was made of the larger disturbances in the usual manner, and their laws at Pekin investigated. In this process it was soon perceived that the hours of principal disturbance were those of the day, both in the easterly and in the westerly disturbance deflections; and on subsequently receiving from the computers the annual mean of the diurnal variation corresponding to the whole period of observation (in which the omission of disturbed observations during the hours of the night had been comparatively very inconsiderable), I was not surprised to find that

it exhibited no trace of a double progression. The results were as follows :—

Local Astron. Time.	Variation.	Local Astron. Time.	Variation.	Local Astron. Time.	Variation.
h m	′	h m	′	h m	′
0 6	1·55 W.	8 6	0·19 W.	16 6	0·53 E.
1 6	2·26 W.	9 6	0·10 W.	17 6	0·57 E.
2 6	2·32 W.	10 6	0·00	18 6	0·94 E.
3 6	1·85 W.	11 6	0·15 E.	19 6	1·51 E.
4 6	1·21 W.	12 6	0·30 E.	20 6	2·06 E.
5 6	0·65 W.	13 6	0·45 E.	21 6	2·10 E.
6 6	0·29 W.	14 6	0·49 E.	22 6	1·24 E.
7 6	0·21 W.	15 6	0.52 E.	23 6	0·20 W.

If we examine these figures, we perceive that the motion from west to east, commencing at the turning hour between 1 and 2 in the afternoon, though comparatively slow during the hours of the night, is continuous and uninterrupted until the extreme easterly elongation is reached between 8 or 9 in the following morning, and that no other turning hours intervene between those of the extreme easterly between 8 and 9 A.M. and the extreme westerly between 1 and 2 P.M.

The phases of the solar-diurnal variation, as they are shown by the Pekin Observations, may be stated as follows :—The north end of the magnet is at its extreme eastern elongation about half-past 8 in the morning; at this hour it begins to move to the west, and moves rapidly in this part of its daily course, completing its whole movement in that direction in five hours, and reaching its extreme western elongation at about half-past 1 P.M. From this hour it returns, somewhat less rapidly than in its forenoon excursion, until about 6 P.M., when the rate of progression is considerably lessened, but continues in the same direction through the hours of the night, until about 5 A.M., when it again accelerates until the eastern extreme is attained, as already stated, about $8\frac{1}{2}$ A.M. There is thus a very unequal division of time in the direction of the motion, which takes five hours in the progress from east to west, and nineteen hours in returning from west to east through the same arc. We find a more equal division of time if we regard the greater or less *rapidity* of the motion: there are about twelve hours in which the motion is comparatively quick, and twelve hours

in which it is comparatively slow; the quick hours being those of the day, the slow hours those of the night.

Thus far the notice we have taken of the Pekin results has been limited to the diurnal variation which we find when we take an average of the *whole* year, and which we may theoretically suppose would take place in every month of the year if the sun were always in the plane of the equator. But similar investigations had already made known to us the existence of a *semiannual inequality,* having opposite phases according as the sun has north or south declination; with turning epochs about the times of the solstices, and the phases passing into each other about the times of the equinoxes. I have already, on a former occasion (Proceedings of the Royal Society, May 18, 1854), submitted to the consideration of the Society the concurrent evidence from three stations, Toronto, Hobarton, and St. Helena, of the existence of this inequality, and of the almost uniform character of its phases at those stations, from which I ventured to infer the probability that an inequality having a similar character would be found to be a general phenomenon. I am now able to add to the evidence which was then adduced, a representation of the semiannual inequality at three additional stations, viz. at the Cape of Good Hope, of which the particulars in detail will be found in the 2nd volume of the 'St. Helena Observations,'— at the Kew Observatory, taken from the hourly tabulations from the photographic curves obtained by the self-recording declinometer at that station,— and at Pekin, as shown in the following tabular view :—

Semiannual Means of the Solar-diurnal Variation at Pekin.

Local Astron. Time.	April to Sept.	October to March.	Local Astron. Time.	April to Sept.	October to March.	Local Astron. Time.	April to Sept.	October to March.
h m	′	′	h m	′	′	h m	′	′
0 6	2·34 W.	0·76 W.	8 6	0·40 W.	0·02 E.	16 6	0·84 E.	0·21 E.
1 6	3·09 W.	1·44 W.	9 6	0·29 W.	0·09 E.	17 6	1·15 E.	0·00
2 6	3·06 W.	1·58 W.	10 6	0·26 W.	0·26 E.	18 6	2·07 E.	0·19 W.
3 6	2·53 W.	1·18 W.	11 6	0·08 W.	0·39 E.	19 6	3·04 E.	0·02 W.
4 6	1·79 W.	0·64 W.	12 6	0·13 E.	0·46 E.	20 6	3·46 E.	0·66 E.
5 6	1·02 W.	0·27 W.	13 6	0·43 E.	0·47 E.	21 6	2·80 E.	1·40 E.
6 6	0·43 W.	0·16 W.	14 6	0·63 E.	0·36 E.	22 6	1·15 E.	1·33 E.
7 6	0·34 W.	0·08 W.	15 6	0·73 E.	0·31 E.	23 6	0·76 W.	0·36 E.

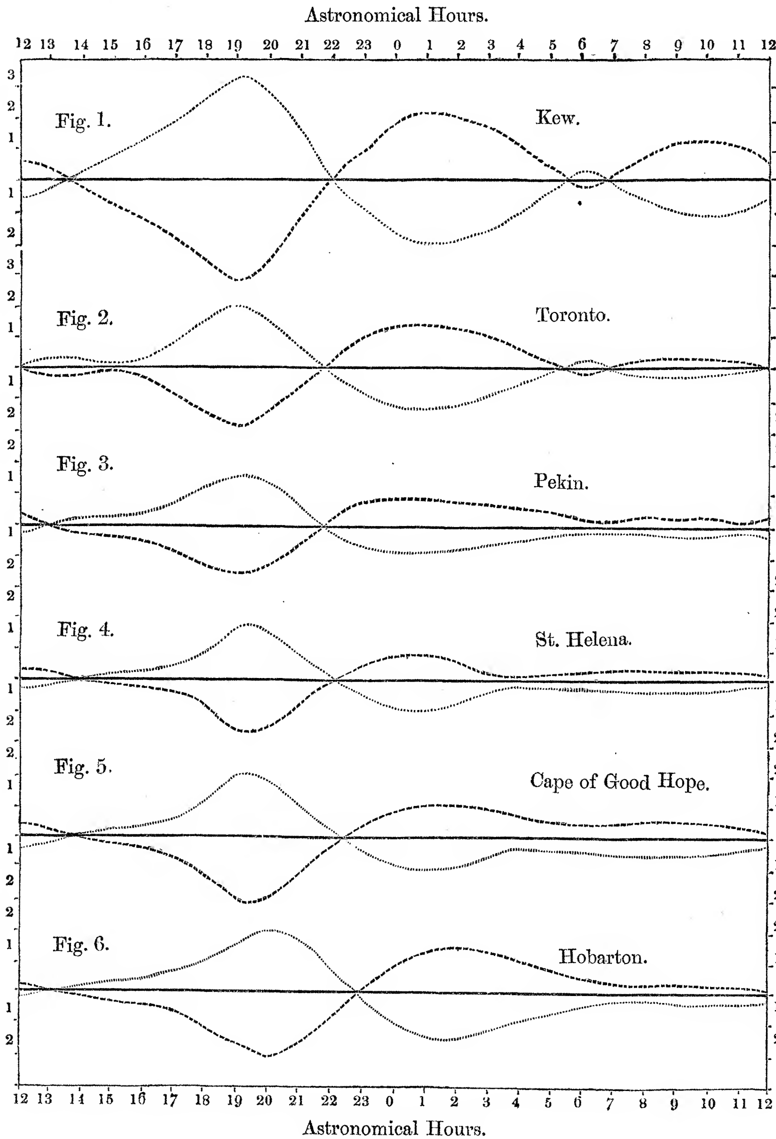
As the correspondence of such phenomena is often far better judged of by the eye, when exhibited in the form of curves, than by

the comparison of tables, I have exhibited in a diagram the phases of the semiannual inequality at the six stations, by which it will be seen that they add their confirmation to the inference which I had previously drawn. With this additional evidence of its uniform character in different parts of the globe, it may be hoped that the claim of the semiannual inequality to be received as a successful generalization from a careful and comprehensive induction may be admitted, and that as an accession to our positive knowledge it may have a recognized place amongst the facts of the diurnal variation, which have to be accounted for in the theories which may be hereafter adduced for their physical explanation.

We now, therefore, recognize three classes of phenomena derived from three different sources, which are superposed in the diurnal variation obtained from the unreduced observations, and which for a proper understanding of the whole, require to be separated from each other by a proper analysis, so that the part due to each may be distinctly ascertained: these are—1st, the mean effects of the magnetic storms; 2nd, the semiannual inequality of the regular solar-diurnal variation; and 3rd, the mean solar-diurnal variation of the year into which the semiannual differences merge. The distinctive characteristics of the first, viz. the disturbance diurnal variation, have already been stated in the early part of this paper, together with the evidence they supply of being due to some modification of the solar action,—justifying their being treated as distinct and separate from the affections which constitute the more regular variation. There are also distinctive characters in the phenomena of the semiannual inequality, and in those of the mean variation, which appear to point out a difference in the mode in which the primary cause operates in producing the two classes of phenomena. For the purpose of explaining this difference, we may employ, as more likely to be generally understood, the usual custom of referring all deflections, whether in the northern or the southern hemisphere, to the north end of the magnet; we say then that, in the mean variation, the directions of the deflection are uniform throughout the year in the middle latitudes of the one hemisphere, and (although opposite) are also uniform throughout the year in the middle latitudes of the other hemisphere; whilst in the semiannual inequality, the directions of the deflection are uniform in the two

Solar-diurnal Variation of the Magnetic Declination.—Semiannual Inequality.

The Black line indicates the Mean Solar-diurnal Variation in the year.
The Broken line indicates Semiannual Means, October to March.
The fine dotted line indicates Semiannual Means, April to September.



hemispheres, but opposite in the two half years. In the one case the effects are hemispherical, in the other semiannual. It is this peculiarity which gives to the "April to September" branch of the semiannual inequality its analogy with the diurnal variation which prevails throughout the year in the middle latitudes of the *northern* hemisphere, and to the "October to March" branch its analogy with the diurnal variation which prevails throughout the year in the middle latitudes of the *southern* hemisphere. The analogies extend even to the small but apparently systematic difference which exists between the turning hours of the mean variation in the two hemispheres, and of the semiannual variation in the two half years. The turning hours of the variation in the northern hemisphere, and of the "April to September" semiannual branch, appear to occur systematically about an hour earlier than those of the southern hemisphere, and of the "October to March" semiannual branch. This is a connecting link which draws still nearer the analogies of which the broader features have been frequently noticed and commented upon; and is the more remarkable on account of the diversity which in other respects seems to distinguish the mode of operation by which the solar influence produces in the one case hemispherical difference with annual agreement, and in the other case semiannual difference with hemispherical agreement.

Thus at Pekin, regarded as a station in the middle latitudes of the northern hemisphere, if we view the semiannual mean of the six months from April to September, we see repeated the general features of the annual mean, reinforced by the semiannual inequality of kindred character with itself; the deflections of both having the same direction at the same hours, the range becomes enlarged, but its characteristics are unchanged; the progression is still a single one, as is the case in the annual mean, with but one easterly and one westerly extreme, the hours of which are slightly earlier than those of the annual mean, by reason of a particular feature of the semiannual inequality spoken of above. When, on the other hand, we direct our attention to the semiannual mean from October to March, we see the consequence of the superposition upon the annual mean of the opposite semiannual inequality belonging to these months: this is most particularly shown in the effect produced upon the semiannual mean by the great semiannual loop which culminates about

6 or 7 A.M. This deflection, which is opposite in direction to that appropriate to the hemisphere, prevails over it so far as to interrupt the progression, which on the mean of the year is continuous, and to produce a secondary maximum at about 7 A.M. This opposite deflection to that which is normal in the hemisphere, taking place at the hours when the semiannual inequality is greatest, is a common feature whenever, in the middle latitudes of either hemisphere, the mean diurnal variation of the one hemisphere is combined with the semiannual inequality which has the opposite analogy. The hour of principal discordance between them is always nearly the same, being determined by that of the principal deflection on the semiannual curve, which, as seen in the diagram, is nearly identical in solar time in all parts of the globe. In the semiannual mean from October to March the principal turning hours are a little later than in the annual mean, just as we have seen above that, in the April to September mean, the turning hours are a little earlier than in the annual, and for the same reason. Finally, it is this combination of the hemispherical and semiannual effects which creates the differences we observe in the amount and hours of the solar-diurnal variation in the different months in the middle latitudes of both hemispheres.

There is one more feature of some importance to the general theory of the diurnal variation, which is illustrated by the Pekin observations, and requires a brief notice. A distinction has been elsewhere pointed out (Cosmos, English Translation, Longman's Edition, vol. iv. p. 504, Editor's Note) between the diurnal variation of the equatorial zone and that of the middle latitudes, consisting in the circumstance that in the equatorial zone the amount of the semiannual deflection is greater than that of the hemispherical deflection at the hours when they are opposed to each other, and by its preponderance *changes the character*, instead of *simply diminishing the amount*, of the hemispherical deflection. The change in the signs of the deflection at 6 and 7 A.M. in the semiannual mean from October to March at Pekin is an illustration of this peculiarity, and ought perhaps in strictness to cause Pekin to be included in the magnetically equatorial zone; but being only just within the border, it has been found more convenient to dwell on this occasion upon the features which it has in common with stations in the middle latitudes.

The diurnal variation at Pekin reaches its extreme deflections at the same hours of solar time, as is the case at the other stations in

the northern hemisphere where the phenomena have been examined with equal care. This fact is not in accord with the opinions of those physicists who regard the solar action as conditioned in its exercise by the direction of the magnetic meridian at the particular station. In the different stations in the northern hemisphere, where the extreme deflections have been found to take place at the same hours of solar time, the differences in the direction of the magnetic meridian have not been less than 70°, equivalent to a difference of solar time of between four and five hours.

I ought not to close this paper without adverting to the success which has attended Mr. Scatchkoff's employment of native Chinese as his assistants in the work of the Pekin Observatory, holding out as it does an encouraging example to Directors of Observatories who may be similarly circumstanced. A very close test of the care and fidelity with which observations have been made and recorded is furnished by the lunar-diurnal variation, deducible from them when they have been re-arranged under the lunar hours to which they severally belong. Thus tested, the Pekin observations show no inferiority to those of other stations which have been similarly examined.

It is understood that the observations, which were discontinued at Pekin at the end of 1855, are about to be recommenced,or have been so already. It is greatly to be desired that hourly obervations of the Horizontal and Vertical Forces should be combined with those of the Declination at this important station. The self-recording apparatus of the three elements which has been in action at Kew during the last two years, has been found, by the reduction of its tabulated values at hourly intervals, to be in no respect practically inferior to the method of eye-observation, whilst it possesses many advantages which are peculiarly its own. The tabulation from the Photographic Curves, as well as the reductions, might be made, if more convenient, at the central Physical Observatory at St. Petersburgh.

March 15, 1860.

Sir BENJAMIN C. BRODIE, Bart., President, in the Chair.

Robert Patterson, Esq., was admitted into the Society.

The following communications were read :—

I. "Analysis of my Sight, with a view to ascertain the focal